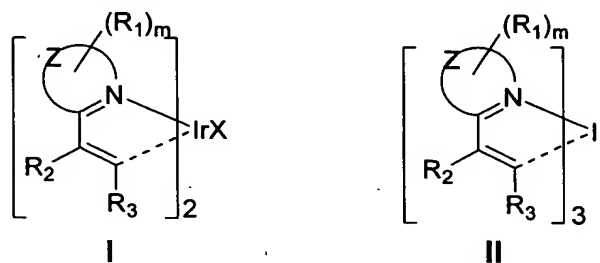


Claim:

1. An organic light emitting diode (OLED) comprising: an anode on a substrate, an electroluminescent medium on said anode, and a cathode on said electroluminescent medium, characterized in that said electroluminescent medium comprises a light emitting layer comprising a phosphorescent Ir complex having the following structures (I) or (II):



wherein X is an arbitrary monoanionic bidentate ligand;

Z is an arbitrary atomic moiety capable of forming a nitrogen-containing heterocyclic group;

R₁ is selected from the group consisting of H, halogen, C1-C6 alkyl, halogen-substituted C1-C6 alkyl, C1-C6 alkoxy, phenyl C1-C6 alkyl, amino, and aryl;

m is 0 or any positive integer determined by the ring size of said nitrogen-containing heterocyclic group;

R₂ and R₃ independently are selected from the group consisting of H, halogen, C1-C6 alkyl, halogen-substituted C1-C6 alkyl, C1-C6 alkoxy, phenyl C1-C6 alkyl, amino, aryl, and heterocyclic aryl.

2. The OLED as claimed in Claim 1, wherein said aryl is phenyl, naphthyl, diphenyl, anthryl, pyrenyl, or phenanthryl; said heterocyclic aryl is benzofurane or thiophene.
3. The OLED as claimed in Claim 1, wherein said nitrogen-containing heterocyclic group is pyridine, quinoline, isoquinoline, pyrazine, pyrimidine, pyrrole, pyrazole, imidazole, indole, thiazole, isothiazole, oxazole, isoxazole, benzothiazole, benzoxazole, or phenanthroline.

4. The OLED as claimed in Claim 1, wherein R_2 is H or methyl; and R_3 is C1-C6 alkyl or aryl group.

5. The OLED as claimed in Claim 4 wherein R_3 is methyl, phenyl or naphthyl.

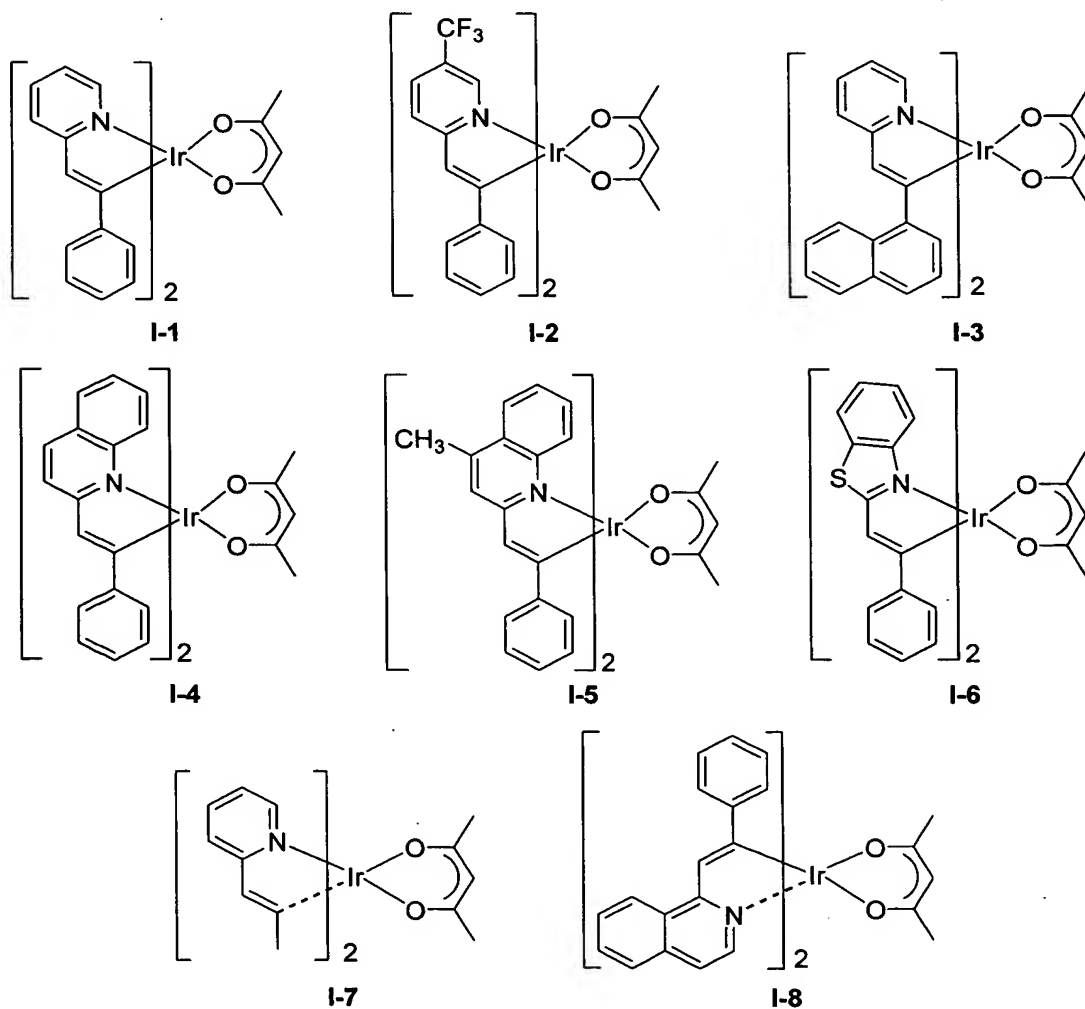
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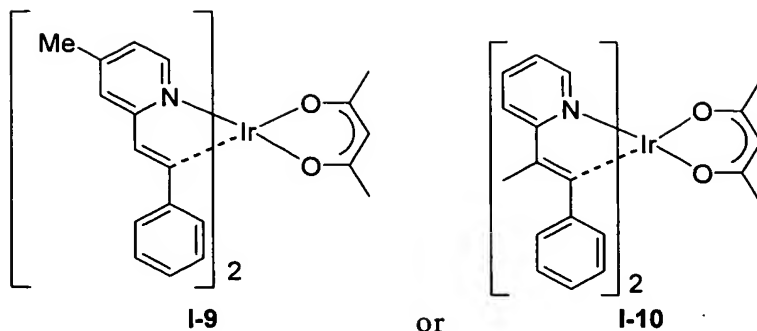
6. The OLED as claimed in Claim 1, wherein X is acetylacetonate, aminoacid, salicylaldehyde, or iminoacetone.

7. The OLED as claimed in Claim 6, wherein X is acetylacetonate.

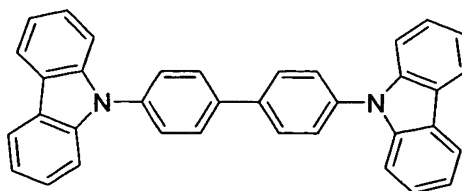
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8. The OLED as claimed in Claim 1, wherein said phosphorescent Ir complex is

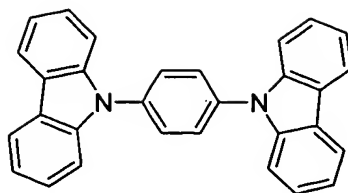




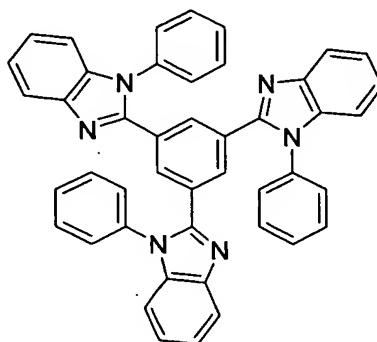
9. The OLED as claimed in Claim 1, wherein said light emitting layer will emit yellow to red light, when a voltage is applied on said anode and said cathode.
- 5 10. The OLED as claimed in Claim 1, wherein said light emitting layer further comprises a host compound, and said Ir complex is doped into said host compound.
- 10 11. The OLED as claimed in Claim 10, wherein said host compound is a compound having a hole transporting capability.
12. The OLED as claimed in Claim 10, wherein said host compound is a compound having an electron transporting capability.
- 15 13. The OLED as claimed in Claim 11, wherein said compound having a hole transporting capability is:



- 20 14. The OLED as claimed in Claim 11, wherein said compound having a hole transporting capability is:



15. The OLED as claimed in Claim 12, wherein said compound having an electron transporting capability is:

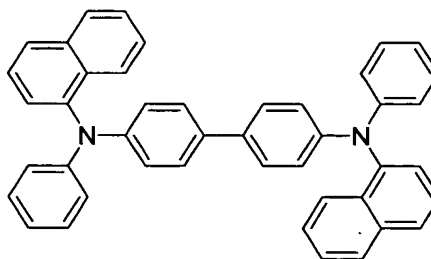


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16. The OLED as claimed in Claim 1, wherein said electroluminescent medium further comprises a hole transporting layer between said anode and said light emitting layer.

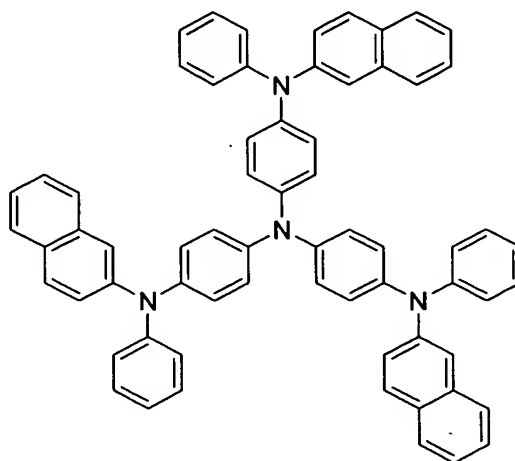
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17. The OLED as claimed in Claim 16, wherein said hole transporting layer comprises a compound of the following structure:



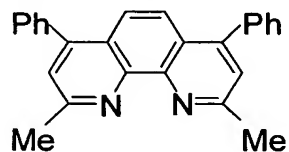
- 15 18. The OLED as claimed in Claim 16, wherein said electroluminescent medium further comprises a hole injection modification layer between said anode and said hole transporting layer.

19. The OLED as claimed in Claim 18, wherein said hole injection modification layer comprises a compound of the following structure:



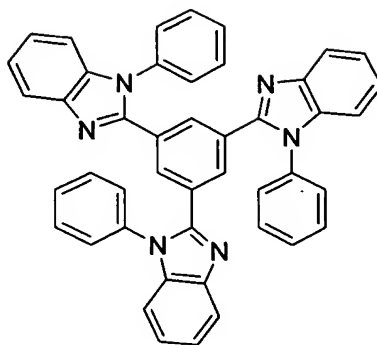
5 20. The OLED as claimed in Claim 1, wherein said electroluminescent medium further comprises a hole-blocking layer between said cathode and said light emitting layer, and said hole-blocking layer contacts said light emitting layer.

21. The OLED as claimed in Claim 20, wherein said hole-blocking layer
10 comprises a compound of the following structure:

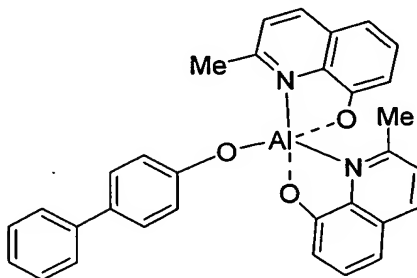


wherein Ph is phenyl, and Me is methyl.

22. The OLED as claimed in Claim 20, wherein said hole-blocking layer
15 comprises a compound of the following structure:



23. The OLED as claimed in Claim 20, wherein said hole-blocking layer comprises a compound of the following structure:



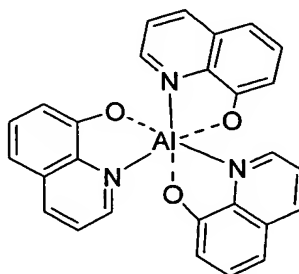
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wherein Me is methyl.

24. The OLED as claimed in Claim 20, wherein said electroluminescent medium further comprises an electron transporting layer between said hole-blocking layer and said cathode.

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25. The OLED as claimed in Claim 24, wherein said electron transporting layer comprises a compound of the following structure:



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